

CLAIMS

1. A process for producing a metal nanoparticle composite film containing metal nanoparticles dispersed in a polyimide resin film, the
5 process comprising the steps of (a) treating the polyimide resin film with an alkali aqueous solution to thereby introduce a carboxyl group, (b) bringing the resin film into contact with a solution containing metal ions, to thereby dope the metal ions in the resin film, and (c) performing thermal reduction treatment in a reducing gas, thereby producing the
10 metal nanoparticle composite film containing the metal nanoparticles dispersed in the polyimide resin film, wherein the volume filling ratio of the metal nanoparticles in the composite film is controlled by regulating the thickness of a nanoparticle dispersed layer formed in the polyimide resin film with the thermal reduction treatment in the reducing gas in said
15 step (c).

2. A process for producing a metal nanoparticle composite film according to Claim 1, wherein when the thermal reduction treatment is performed in the reducing gas in said step (c), the thickness of the nanoparticle dispersed layer is regulated by controlling a heat treatment
20 time.

3. A process for producing a metal nanoparticle composite film according to Claim 1, further comprising the steps of performing the heat treatment in the reducing gas at temperature not lower than the reduction temperature of the metal ions in said step (c), to thereby form a layer
25 containing the metal nanoparticles dispersed in a polyimide resin, and (d) performing another heat treatment at temperature different from the

temperature of the aforesaid heat treatment, to thereby regulate the thickness of the metal-nanoparticle dispersed layer.

4. A process for producing a metal nanoparticle composite film according to Claim 3, wherein the heat treatment after the formation of the metal-nanoparticle dispersed layer in said step (d) is performed at temperature lower than the temperature at which the metal-nanoparticle dispersed layer has been formed.

5. A process for producing a metal nanoparticle composite film according to Claim 3, wherein the heat treatment after the formation of the metal-nanoparticle dispersed layer in said step (d) is performed at temperature higher than the temperature at which the metal-nanoparticle dispersed layer has been formed.

6. A process for producing a metal nanoparticle composite film according to any one of Claims 3 to 5, wherein the heat treatment after the formation of the metal-nanoparticle dispersed layer in said step (d) is performed in an inert gas.

7. A process for producing a metal nanoparticle composite film according to any one of Claims 1 to 6, wherein an aqueous solution of potassium hydroxide or sodium hydroxide is used as the alkali aqueous solution in said step (a).

8. A process for producing a metal nanoparticle composite film according to any one of Claims 1 to 7, wherein the solution containing the metal ions used in said step (b) contains one or more kinds of metal ions selected from among nickel, cobalt and iron.

9. A process for producing a metal nanoparticle composite film according to any one of Claims 1 to 8, wherein the reducing gas used in said step (c) is a hydrogen gas.